form of their material as were formerly their confreres of the Paleozoic, who needed nearly a hundred years to recognize that many of the arboreal forms of the carboniferous forests were not seed plants but vascular cryptogams, a view long urged by the anatomists and finally admitted on every hand. The flora of the Middle Eocene of Georgia is chiefly interesting because of the fact that it clearly marks, in the opinion of the author, a warmer climate for that epoch than for the early Eocene.—E. C. JEFFREY.

Phylogenetic taxonomy of angiosperms.—Professor BESSEY for many years was interested in a phylogenetic scheme of classification, especially with reference to the angiosperms. In a series of papers he has developed his point of view, and his final paper was presented in connection with the twenty-fifth anniversary celebration of the Missouri Botanical Garden.[15] An interesting feature of the paper is the definite formulation of the principles of classification as applied to flowering plants. These principles are given in the form of 28 "dicta," 7 of them of general application, and the remainder having special reference to flowering plants. These dicta announce the primitive and derived condition in reference to numerous structures, some of them generally accepted, and some of them under discussion. The author then applies these numerous dicta to the taxonomic complexities of angiosperms. He substitutes "Oppositifoliae" and "Alternifoliae" for the old names dicotyledons and monocotyledons, on the theory that dicotyledons are primitively opposite-leaved, as shown by their cotyledons; and by the same sign monocotyledons are essentially alternate-leaved. With this start, and in this way, the whole sequence of angiosperms is presented in 300 families, beginning with Alismataceae and ending with Lactucaceae (the Compositae being presented as 14 families). It is a very laborious assembling of material on the basis of assumed phylogenetic sequences, quite comparable with Engler's *Syllabus*, and useful in the same way.—J. M. C.

Amoeboid movements of chromatophores.—The large epidermal leucoplasts of mature leaves of *Orchis latifolius* and *O. incarnatus*, according to KÜSTER,[16] display amoeboid changes of form, having the power to put out and take in processes resembling pseudopodia. Also these leucoplasts at times break up into a large and small portion, which in turn may again fuse. KÜSTER does not accept the idea of SENN that there is a peristromium surrounding the chromatophore, holding rather that the pseudopodia belong to the chromatophore itself. Sometimes the chromatophore as a whole moves in the direction taken by a pseudopodium, thus exhibiting active movement. More commonly, however, a leucoplast suffers no change in position, following a pseudopodial

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[15] BESSEY, CHARLES E., The phylogenetic taxonomy of flowering plants. Annals Mo. Bot. Gard. 2:109–164. *fig. 1.* 1915.

[16] KÜSTER, ERNST, Über amöboide Formveränderungen der Chromatophoren höherer Pflanzen. Ber. Deutsch. Bot. Gesells. 29:362–369. *figs. 4.* 1911.

movement. KÜSTER believes that the usual movement of chromatophores is passive, these organs being carried in the direction of protoplasmic streaming, whatever the direction taken by the pseudopodia. From these studies it is concluded that the chromatophores in question are fluid. It is suggested that other chromatophores, as those in *Listera* and *Iris*, may have the characteristics of the *Orchis* chromatophore.—H. C. COWLES.

Parthenogenesis in Nicotiana.—GOODSPEED[17] has made some very interesting experiments in connection with parthenogenesis in *Nicotania*, suggested by a strain of *N. Tabacum* in which Mrs. R. H. THOMAS reports parthenogenesis. Over 500 attempts to produce parthenogenetic seed from a number of species and varieties of *Nicotiana* yielded negative results. These experiments included crossing and propagation through several generations. In the case of the parthenogenetic strain referred to, however, approximately 800 experiments resulted in over 100 normally matured fruits. In the majority of these parthenogenetic fruits empty seeds were produced in great numbers, and for this type of seed production, either with or without pollination, GOODSPEED suggests the term "phenospermy," referring to the seed condition usually described as "abortive" or "empty." Approximately 50 seeds occurred in nine of the parthenogenetic fruits, some of which showed mature endosperm and embryos. A small proportion of the seed from the parthenocarpic fruits was neither parthenogenetic nor phenospermic, but contained traces of endosperm only.—J. M. C.

Bactericidal substances.—That the juices of plants may contain bactericidal substances which figure in protecting the plants against the attacks of certain organisms has been shown by WAGNER.[18] Varying numbers of bacteria of the non-parasitic species *Bacillus vulgatus*, *B. asterosporus*, and *Bacterium putridum* were injected into the tissues of potato tubers, beet roots, and the leaves and roots of *Sempervivum Hausmanii.* The injected organisms proved parasitic only when present in enormous numbers (3000–8000), and in that case were able to bring about the decay of the injected tissues. When injected in smaller numbers, the bacteria are destroyed. In case of the potato and of *Sempervivum*, the freshly expressed juice was found to possess bactereolytic and agglutinating properties, but from the sugar beet no bactericidal juice could be obtained. The active substances were found to be contained in the protein fraction of the juice. When the fresh filtered juice containing enzymes, carbohydrates, and salts is allowed to stand for two days, its bactericidal power is destroyed, probably by the action of oxidases and other enzymes.—H. HASSELBRING.

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[17] GOODSPEED, THOMAS H., Parthenogenesis, parthenocarpy, and phenospermy in *Nicotiana*. Univ. Calif. Pub. Bot. 5:249–272. *pl.* 35. 1915.

[18] WAGNER, R. J., Über bakterizide Stoffe in gesunden u. kranken Pflanzen. 1. Mitteilung: Die gesunde Pflanze. Centralb. Bakt. II. 42:613–624. 1914.